

Human Impact and Breeding Success in Southern Giant Petrel *Macronectes giganteus* on King George Island (South Shetland Islands)

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ABSTRACT. Southern Giant Petrel is considered to be very sensitive to human impact and its number is reported to decline in Fildes Peninsula (King George Island, South Shetland Islands). During austral summer 1996/97 we mapped breeding population of Giant Petrels and surveyed their breeding success. Seven colonies, sized from 5 to 53 nests, were found on the Fildes Peninsula and Ardley Island. Totally there were 103 occupied nests, but only 10 chicks were recorded shortly before fledging. Thus breeding success was 9.7%. Major lost (77%) occurred at the stage of eggs and newly hatched chicks (younger than a week). No relation between colony size and breeding success was noted. However, birds nested in remote regions raised relatively more chicks than birds occupied colonies in proximity of Antarctic stations. Their breeding success constituted 14.3% and 6.0% respectively. We suggest high disturbance level coupling with high numbers of predators to be responsible for low breeding success in Giant Petrels. Fildes Peninsula is one of the most inhabited region in entire Antarctica. Main source of disturbance is low aircraft's flights, and frequent visits of colonies by personnel. Numerous skuas, and nonbreeding Kelp Gulls as well, are attracted by open disposal of eatable waste on Russian, Chilean and Chinese stations.

Key Words: breeding success, Southern Giant Petrel, human impact, Fildes Peninsula

Introduction

Fildes Peninsula on King George Island (South Shetland Islands) is the most populated area in the Antarctic. There are four round-year operating bases along the Maxwell Bay coast belonging to Russia, Chile, China, Uruguay. Transport operations seem to produce the most extensive impact. Since the 1980s Chilean air field has been in permanent operation, and aircraft flights are frequent. High recreation pressure upon ecosystems is maintained not only by the personnel of the Antarctic bases, but also by high tourist load.

Zoological studies were started on the basis of the Russian station Bellingshausen more than 15 years

ago. A number of papers deal with the problem of anthropogenic influence upon vertebrates, and a decrease in breeding population of Southern Giant Petrels (*Macronectes giganteus*) has been reported (Peter *et al.* 1989; Peter *et al.* 1991). The last SCAR review on the status of the Antarctic seabirds (1996), however, noted that nowadays, the evidence of general decreases in Giant Petrel populations is less clear than in 1992. It is also stressed, that there is little, if any, evidence of change in populations due to human activities in the vicinity of breeding colonies, though relatively few sites in close proximity to bases are well documented.

Study Area and Method

Our study was conducted during wintering over of

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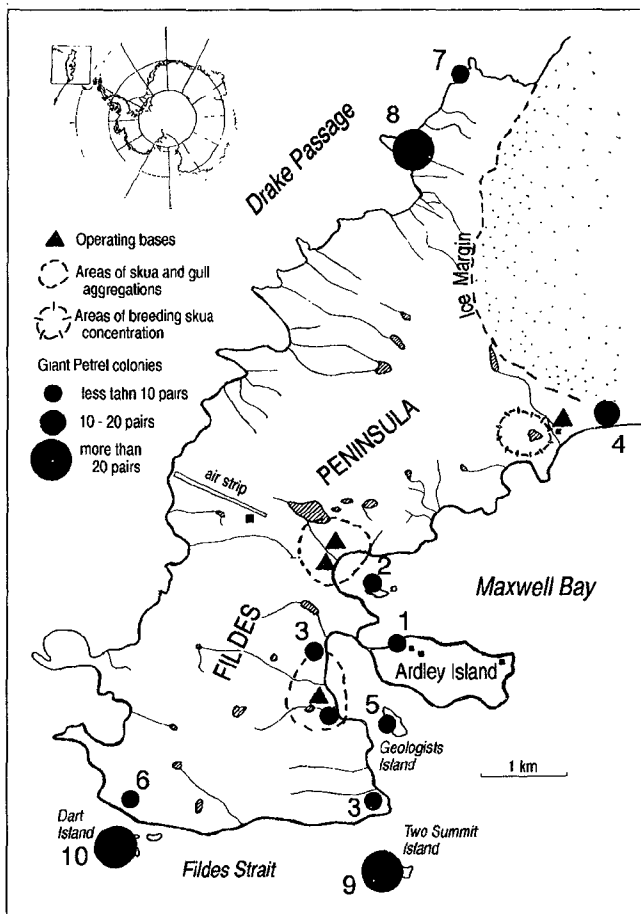


Fig. 1. Distribution of the Southern Giant Petrel colonies, skua and gull 'clubs'.

the 41st Russian Antarctic Expedition, at the Bellingshausen Station and included continuation of monitoring of the Southern Giant Petrel as a species being highly vulnerable regarding human impact. We mapped breeding colonies of the petrels, surveyed breeding success by visiting colonies three times in the course of breeding season, banded chicks before fledging. Observations on behaviour of Giant Petrels were also conducted.

Results and Discussion

During Austral summer 1996-97 on the Fildes Peninsula and Ardley Isle we monitored seven colonies of the Southern Giant Petrels (Fig. 1). The data on colony size, changes in numbers of eggs and chicks in the course of breeding season are given in the Table 1.

Colony 1. "Ardley" is known since the beginning

of the 1970s (Simonov 1973). It is situated on a small isle connecting with the peninsula by a narrow spit. There are three permanent bases at a distance of 1-2 km from the colony. There is also a periodically operating scientific field hut on the isle. There were 8 occupied nests during the egg laying period, but most clutches died during incubation. At this time the isle was frequently visited by personnel of the nearby bases for walking and filming. In early January there were still two occupied nests, but one was deserted after a helicopter flew low over the isle on January 9.

Colony 2. "Albatross Island" is situated in the proximity of the Russian and Chilean bases. The Giant Petrels breed on the isle regularly. In spring of 1996, 5 pairs made a breeding attempt, but already by the end of November all nests were preyed by skuas (we found egg shells around).

Colony 3. "The Great Wall". In the vicinity of the Chinese base petrels settled as a small group of 2-4 pairs. Totally 11 pairs started to breed here, but no one was able to raise offspring.

Colony 4. "Nobles Point" is situated next to the Uruguay base 'Artigas'. We found here 14 breeding pairs, but all of them failed during incubation and hatching periods.

Colony 6. "Fildes Strait". On the coast of Fildes Strait, just opposite the Dart Isle, small colony of 7 nests was found. This colony appeared to be the most successful among all under our control. Only about half of the clutches died, and the overall breeding success was as high as 42.9%.

Colony 7. "The Drake Passage". A small settlement on the Drake Passage coast was examined on January 23, 1997. We found 5 nests of the Giant Petrels constructed in this season, but all of them were already deserted.

Colony 8. "Priroda Base" is situated next to the Russian field base which has not been in operation for some time. Being the most remote colony of the currently operating bases, it is nevertheless visited periodically by the personnel. This colony, one of the biggest within the area under consideration, numbered 53 occupied nests. By the end of January there were 20 newly hatched chicks of less than one

Table 1. Colony size and breeding success in the Giant Petrels on the Fildes Peninsula. The data on 1983-85 after Peter *et al.* (1988) and data (*) after H.-U. Peter (pers. com.)

Location	Ardley Island	Albatross Island	Great Wall Station	Nobele Point	Geologist Island*	Fildes Strait	Drake Passage	Priroda Base	Two Summit Island*	Dart Island*
Number of occupied nests in 1983-85	12-17	6	33	116-118	17(min)	5	8	42	45	50
Number of occupied nests in 1996/97	8	5	11	14	2	7	5	53	64	50
Number of 1-week old chicks	1	0	0	0	?	3	?	20	?	?
Clutches & newly hatched chicks died	87.5%	100%	100%	100%	?	57.1%	?	62.3%	?	?
Number of chicks before fledging	1	-	-	-	?	3	0	6	?	?
Chicks died	0%	-	-	-	?	0%	-	70%	?	?
Total breeding success	12.5%	0%	0%	0%	?	42.9%	0%	11.3%	?	?
Base proximity	+	+	+	+	+	-	-	-	-	-
Combined breeding success	2.6% (n=38)				13.8% (n=65)					

Table 2. Breeding success in Southern Giant Petrels

Locality	Overall breeding success (%)	Source
Bird Island	69.9 (± 4.5), n=4	Hunter (1984)
Terre Adélie	52.4 (± 10.4), n=5	Mougin (1975)
Signy Island	41.1	Conroy (1972)
Iles Crozet	22.8	Mougin (1975)
Fildes Peninsula 1984/85	45.0	Peter <i>et al.</i> (1988)
Fildes Peninsula 1996/97	9.7	this study

week old and two still brooded eggs. The latter, as appeared, were unfertilised. Clutch lost was found here to be 62.3%. Seven chicks survived until one and a half month old, which constituted 70% of chick mortality at the early stage of development. Six chicks survived until fledging as one died by unknown reason at the age of 2.5 months. Thus, overall breeding success was only 11.3%. Additionally, a brief survey of breeding colonies was conducted at the end of January on the small isles nearby the peninsula. Three colonies were examined as follows: Geologists Isle - 2 nests, Two Summit Isle - 64 nests and Dart Isle - 50 nests (Peter,

pers. com.).

The overall breeding success of the Southern Giant Petrels within the study area was found to be as small as 9.7% (n=103), that is much less than has ever been reported from the other areas and from the Fildes Peninsula previously (Table 2). There is a difference in survival rates between colonies situated in close proximity to the Antarctic bases and remote ones (see Table 1). These two clusters also demonstrate opposite population trends: the numbers of birds nesting in the vicinity of human settlements decreased by 80% during past 12-13 years, while population of the remote colonies was stable and even increased a little (20%).

Normally, egg lost is reported to be resulted mainly from desertion or infertility, while chick usually die because of starvation and exposure. Uncovered eggs are easily preyed by skuas (Hunter 1984; Peter *et al.* 1991). There are two sensitive periods in their breeding cycle, when maximum offspring mortality occurred:

- Egg laying and early incubation. In our study two thirds of clutches were lost at this stage (Fig. 2).
- Early guard period. More than a half of newly hatched chicks died according our observations.

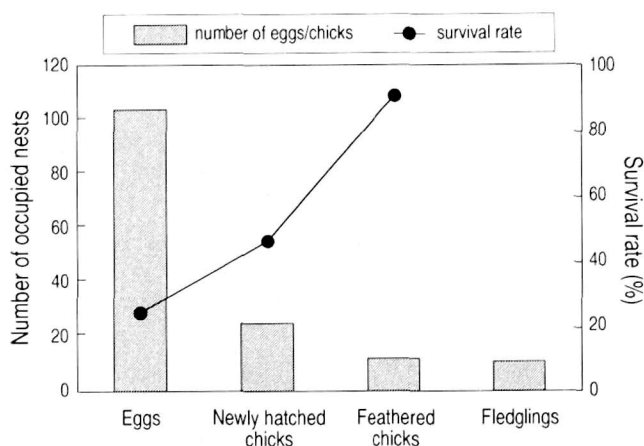


Fig. 2. Dynamics of occupied nests of the Southern Giant Petrels.

Human impact involving exposure of nests or small chicks, deserted by disturbed birds, either to predators or severe weather, may contribute considerably to the mortality. The Giant Petrels are relatively shy as compared to other petrels and readily leave their nests being disturbed. During first phase of the guard period, the Giant Petrels usually brood closely, but strong disturbance may force the bird to leave the chick.

Extremely low breeding success in Southern Giant Petrels on the Fildes Peninsula, comparison of population dynamics and breeding success in different colonies in relation to the proximity to bases (see Table 1), suggest it is the human impact that is responsible for the breeding failure. There are two ways of negative influence upon breeding Giant Petrels including:

- High level of disturbance, resulted mainly from low (less than 50 m) aircraft flights. We found major nest failure in the colonies along the Hydrographers Cove right after frequent helicopter flights over the area. However, people walking close to nests also made benefit to preying skuas.

- Elevated numbers of predators nearby bases. Aggregations of non-breeding skuas (*Catharacta* spp.) and Kelp Gulls (*Larus dominicanus*) are typical for the vicinity of bases on the Fildes Peninsula. A flock of 30-50 skuas is usually observed nearby Russian and Chilean bases (Fig. 1). Multi-year practice to store edible wastes on the coast of

Hydrographers Bay attracts there a numerous flock of about 120 Kelp Gulls and 60 skuas. Moreover, the Fildes Peninsula is characterized by abundant breeding population of skuas (*Catharacta maccormicki* and *C. lonnbergi*) numbering 240-250 birds in the season of 1996/97. The skuas were observed to prey extensively upon Giant Petrels and we found egg shells in almost all visited colonies.

Very low breeding success in the Giant Petrels on the Fildes Peninsula can be considered as a critical. Modern recruitment rate (1 fledged chick for 10-11 pairs) does not cover the annual adult mortality (about 10%; after Hunter 1984), even assuming all chicks will survive until maturity. Not only decrease in breeding success of the Southern Giant Petrels is observed on the Fildes Peninsula, but overall decline in breeding population as well. Continuing banding program will make clear the reasons for this process.

References

- Conroy J.W.H. 1972. Ecological aspects of the biology of the giant petrel *Macronectes giganteus* (Gmelin) in the maritime Antarctic. *Scient. Rep. Br. Antarct. Surv.* **75**: 1-74.
- Hunter S. 1984. Breeding biology and population dynamics of giant petrels *Macronectes* at South Georgia (Aves: Procellariiformes). *J. Zool. Lond.* **203**: 441-460.
- Mougin J.L. 1975. Ecologie comparée des Procellariidae Antarctiques at Subantarctiques. *CNFR A Publ.* **36**: 1-195.
- Peter H.-U., Kaiser M., and Gebauer A. 1988. Untersuchungen an Vögeln und Robben auf King George Island (South Shetland Islands, Antarktis). Unpubl. report. Berlin. 128 pp.
- Peter H.-U., Kaiser M., and Gebauer A. 1989. Untersuchungen an Vögeln und Robben auf King George Island (South Shetland Islands, Antarktis). *Wiss. Ztschr. Friedrich-Schiller- Univ. Jena, Naturwiss. R.* **38**. Jg., H. 4/5: 645-657.
- Peter H.-U., Kaiser M., and Gebauer A. 1991. Breeding ecology of Southern Giant Petrels *Macronectes giganteus* on King George Island (South Shetland Islands, Antarctic). *Zool. Jb. Syst.* **118**: 465-477.
- Simonov I. 1973. The wildlife of the Fildes Peninsula. *Proc. Arct. Antarct. Res. Inst.* **318**: 183-192. (in Russian)
- Woehler E.J. and Croxall J.P. 1996. *The status and trends of antarctic and subantarctic seabirds.* SC-CAMLR-XV/BG/29. 76 pp.

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